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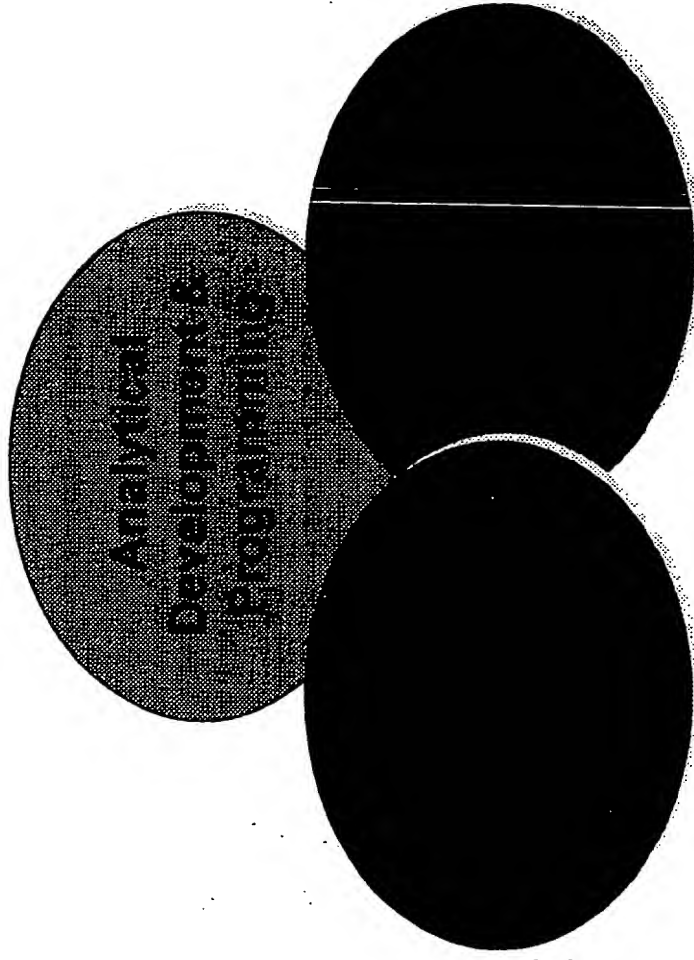
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"IDEAS"

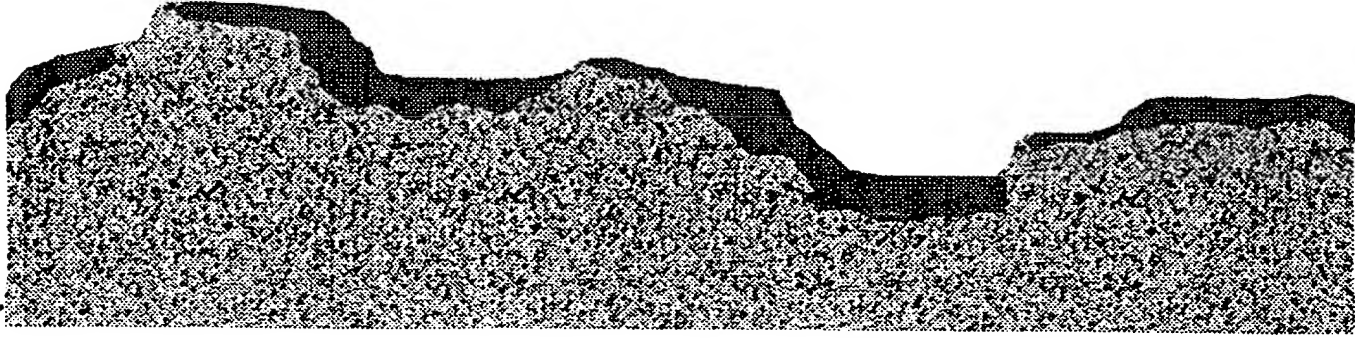
Integrated Dynamic and Engineering Analysis System

**An Advanced
Design Tool to
Simulate the
Drilling Process
(Full Scale
Numerical Drilling
Simulator)**



Output From “IDEAS”

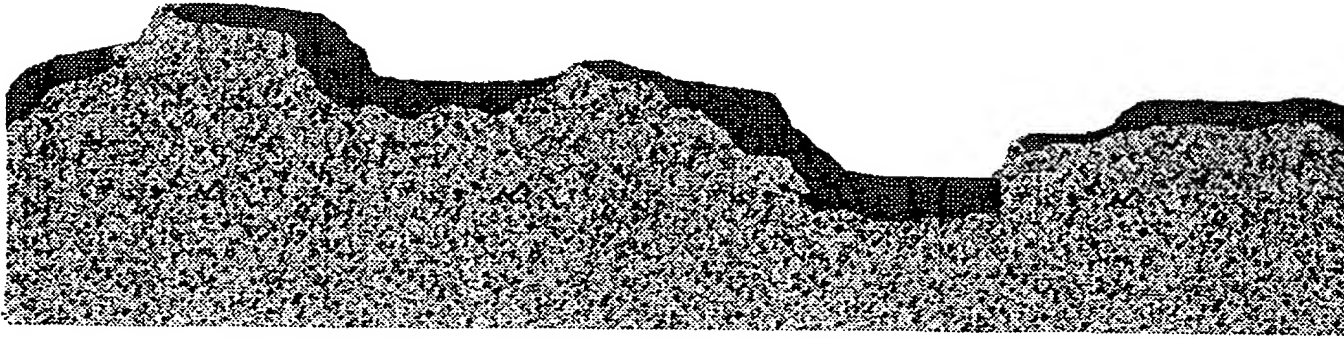
- *ROP Prediction (given WOB, RPM, formation type)*
- *Bottom hole profile and coverage*
- *Dynamic response*
- *Forces on inserts and bit*
- *Scraping vectors*
- *Load on bearings*



Extending “Magnum” Technology into the Six Inch Series Bits

Potential features for inclusion . . .

- *A form of “Trucut”*
- *7/16” Diamond Chisel*
- *Magnum style chisel inserts*
- *New dome vent reservoir*
- *Forging modifications*
- *Improved efficiency 70 series jets*
- *Silver-plated journal bearing components*
- *New dual elastomer seal*



Seal/Seal Gland Development

Dual elastomer seal evolution

- *improved robust gland*
- *new HSN material with lubricant additive*
- *new energizing elastomer*
- *new bonding agent*

Gland surface enhancements

- *low friction*
- *abrasive resistant*

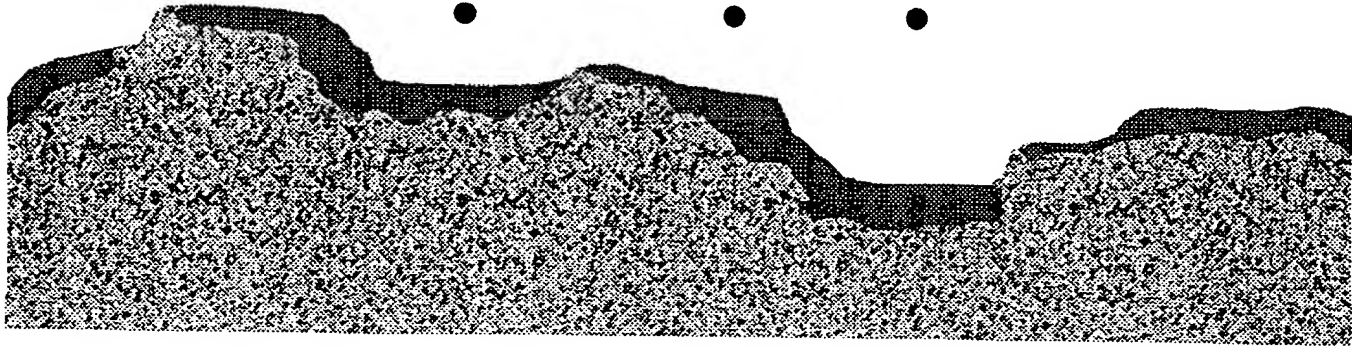
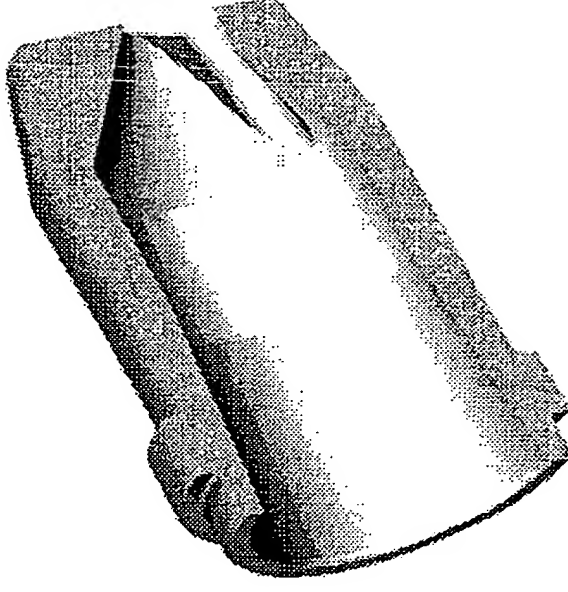
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Vortexx Nozzle Development

- *Exclusive technical agreement with Vortexx Group, Inc.*
- *Currently lab and field testing*
- *Nozzle exit flow field optimization*
 - cone cleaning
 - cross-flow





Enhanced Insert Development

- *Continue to build our fundamental understanding of parameters affecting the performance of enhanced inserts*
- *Develop a system of lab test methods where lab performance correlates to field performance*
- *Application Engineer inserts through advanced diamond compositions, insert geometry, and system design*
- *Belt press technology - Italy:*
 - ensure sufficient supply
 - explore new opportunities for increased insert performance

Other Materials R&D Activities

Cutting Structure

- *New chipping resistant hardfacing materials engineered for specific applications*
- *New welding processes for hardfacing application*
- *New class of cemented tungsten carbide with better wear resistance/toughness (double composite, fibrous, borides and boronizing, etc.)*

Cone Erosion Coatings

- *Paste/tape-infiltration-coating using induction heating*

